McGRAW-HILL ENCYCLOPEDIA OF Science & Technology

7

7th Edition

An international reference work in twenty volumes including an index

McGraw-Hill, Inc.

New York St. Louis San Francisco Auckland Bogotá Caracas Lisbon London Madrid Mexico Milan Montreal New Delhi Paris San Juan São Paulo Singapore Sydney Tokyo Toronto

usually lack eyes, and statocysts are unknown in the Gammaridea.

A pair of excretory organs, the antennal glands, discharges on the second segments of the second antennae. A similar pair of ducts, of unknown origin, opens on the lower lip.

Reproduction. The sexes are separate, and the reproductive systems are simple tubular gonads and ducts, discharging ventrally on the fifth thoracic segment in the female and the seventh in the male. Copulatory amplexion of the sexes occurs while swimming and at the time of molting of the female, when the reproductive orifices are soft and expandable enough to permit passage of the eggs. External fertilization occurs, and the eggs are held in the female brood pouch, which is composed of four pairs of setose plates attached ventrally to thoracic segments 3–6. Development generally requires 12–30 days. The young then hatch as miniature adults and leave the brood pouch hours to days later. The major postembryonic changes concern the secondary sexual characteristics, such as the development of brood lamellae in the female, and the differential enlargement of the gnathopod pairs, especially in the male. Males often develop larger or more sense organs than do females.

The growth of amphipods is poorly known, except that size increases occur as part of the ecdysial mechanism characteristic of arthropods in general. One species, *Gammarus chevreuxi*, is known to reach sexual maturity after six molts, the female then producing a brood of young during each succeeding instar of growth, until death at about the twelfth instar. The length of life has been recorded as 1–2 years or less. The number of eggs produced varies from one or two to more than 200. This depends on the species and increases with the size or age of the adults.

Systematics. The basic morphologic plan in the Gammaridea is rather stable, unlike the Isopoda, for instance, in which many morphological types have developed. Thus, systematic partition of amphipods is based on minor characters, usually the mouthparts. For this reason, specific identification of amphipods is difficult, except by specialists.

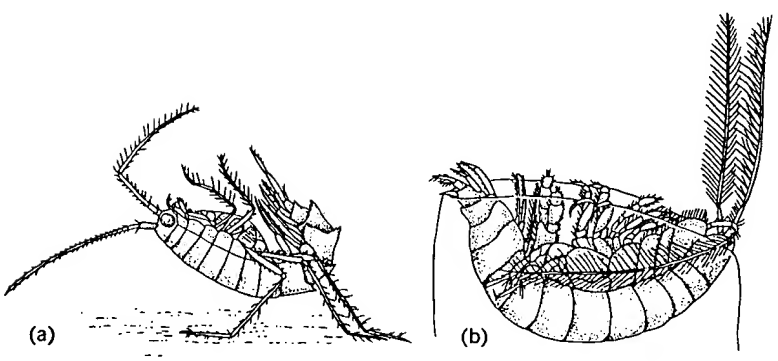
Habits. Gammaridea are largely scavengers, feeding on organic debris or detritus which falls to the ocean bottom (**Fig. 2***a*). In many species the feeding is selective, whereas in others indiscriminate feeding on mud containing small organic particles occurs. The well-developed chewing mouthparts of most amphipods permit the maceration of living plants, such as algae or aquatic grasses. Amphipods also feed on large dead marine animals. This knowledge has been utilized by Alaskan hunters to clean mammalian skulls by immersing them in wire cages in the sea. Swarms of amphipods are attracted to the meaty skull and have been known to clean it within a day. Similar habits are known and utilized in the dermestid beetles.

Species in the families Ampeliscidae, Photidae, and Corophiidae build nesting tubes attached to solid intertidal objects or lying on the sea bottom (Fig. 2*b*). The tubes are spun either from secreting glands on the first two pairs of pereiopods or from cuticular glands on the body. Occasionally, masses of the tubes foul ship bottoms. These animals use their well-developed antennae to strain food particles. *See* FEEDING MECHANISMS (INVERTEBRATE).

Species in the Phoxocephalidae and Haustoriidae have strongly spinose appendages for burrowing into bottom sediments. Some of these ingest mud, while others are selective deposit feeders.

Semiparasitic and commensal species with sucking or lapping mouthparts are known in the families Stenothoidae, Leucothoidae, and Dexaminidae. They inhabit coelenterates, ascidians, and sponges, or grasp lobsters and fish. However, no amphipods are as degenerate as some species of parasitic isopods and copepods. *See* AMPHIPODA; COPEPODA; ISOPODA.

J. Laurens Barnard



g. 2. Soft-bottom amphipods of the Skagerrak. (*a*) *Melphidippella macra* in its inverted alking position on the sea bottom. (*b*) *Haploops tubicola* in feeding position in its tube. fter P. Enequist, *Zool. Bidrag Uppsala, 28:297–492, 1949*)

Ganglion

A group of nerve cell bodies, usually located outside the brain and spinal cord. A ganglion located inside the central nervous system is called a nucleus.

The dorsal root ganglia are rounded clusters of cell bodies and fibers, surrounded by a connective tissue covering, located on the dorsal, or sensory, root of each spinal nerve. They lie just outside the cord and contain the cell bodies of sensory nerves whose fibers originate in some peripheral sensory receptor.

Other ganglia are given specific names which indicate their function or location, such as acoustic, cardiac, carotid, jugular, celiac, and sympathetic ganglia. Sympathetic ganglia, lying on either side of the vertebral column, unite by fiber strands to form a sympathetic chain. Preganglionic axons of the sympathetic system run along this path until they reach their terminal point in these ganglia, where they synapse with the postganglionic neurons. *See* SYMPATHETIC NERVOUS SYSTEM.

The term ganglion may be applied to a tumorlike, often cystic growth found on tendons, joints, and other connective tissues, but this usage is rare. *See* BRAIN; SPINAL CORD.

Walter Bock

Gangrene

A form of tissue death, or necrosis, usually occurring in an extremity and due to insufficient blood supply.

If no bacterial contamination is present, the part becomes dry, greenish-yellow, and finally turns brown or black. This is known as mummification. A sharp inflammatory border marks the edge of the ad-

McGRAW-HILL ENCYCLOPEDIA OF

Science & Technology

7th Edition

An international reference work in twenty volumes including an index

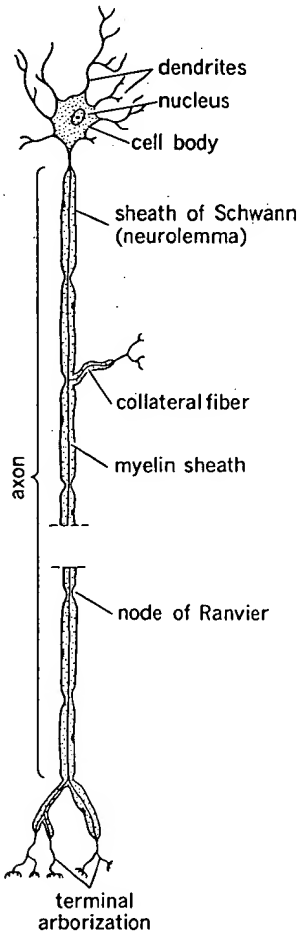
McGraw-Hill, Inc.

New York St. Louis San Francisco Auckland Bogotá Caracas Lisbon London Madrid Mexico Milan Montreal New Delhi Paris San Juan São Paulo Singapore Sydney Tokyo Toronto

521, 1988; D. A. Weigent and J. E. Blalock, Interactions between the neuroendocrine and immune systems: Common hormones and receptors, *Immunol. Rev.*, 100:79–108, 1987.

Neuron

A nerve cell: the functional unit of the nervous system. Structurally, the neuron is made up of a cell body or soma and one or more long processes: a single axon and dendrites (see **illus.**). The cell body contains the nucleus and usual cytoplasmic organelles with an exceptionally large amount of rough endoplasmic reticulum, called Nissl substance in the neuron. The longest cell process is the axon, which is capable of transmitting propagated nerve impulses. There may be none, one, or many dendrites composing part of a neuron. If there is no dendrite, it is a unipolar neuron; with one dendrite, it is a bipolar



Typical vertebrate neuron. (*After C. K. Weichert, Anatomy of the Chordates, 3d ed., McGraw-Hill, 1965*)

neuron; if there is more than one dendrite, it is a multipolar neuron. The dendrites are shorter and more branched than the axon. Dorsal-root spinal ganglia and most cranial nerve ganglia have unusual pseudounipolar neurons. Here a single process leaves the soma and then bifurcates, sending a long peripheral process to skin, muscle, or viscera and sending a central process into the spinal cord or brain. Both processes can conduct nerve impulses. These pseudounipolar neurons are always sensory. In most neurons only the axon propagates nerve impulses; the dendrites and somas are also irritable but do not propagate nerve impulses. *See* NERVOUS SYSTEM (VERTEBRATE).

Douglas B. Webster

Neuroptera

An order of delicate insects having endopterygote development, chewing mouthparts, and soft bodies. Included are the insects commonly termed lacewings, ant lions, dobsonflies, and snake flies. The order consists of about 25 families and is widely distributed.

The adults have long, slender antennae and usually four similar wings, although the front pair is generally slightly larger than the hind pair. The adults of most species are strongly attracted to lights. The larvae, such as the aquatic hellgramite, are aggressive predators. In most of the species (suborder Planipennia) the larval mandibles are modified for piercing and for sucking the blood of prey. The larvae of lacewings are especially destructive to aphids, scale insects, and mites. The pupa of the Neuroptera is usually formed within a silken cocoon. *See* ENDOPTERYGOTA; INSECTA.

Frank M. Carpenter

Bibliography. D. J. Borror et al., *An Introduction to the Study of Insects*, 5th ed., 1984; S. P. Parker (ed.), *Synopsis and Classification of Living Organisms*, 2 vols., 1982.

Neurosecretion

The synthesis and release of hormones by neurons. Such neurons are called neurosecretory cells, and their products are often called neurohormones. Neurohormones function in ways comparable to the hormones produced by the nonneural endocrine cells and glands (**Fig. 1**). In fact, both endocrine and nonendocrine cells are regulated by neurohormones. Like conventional (that is, nonglandular or ordinary) neurons, neurosecretory cells are able to receive signals from other neurons. But unlike ordinary neurons that have cell-to-cell communication over short distances at synapses, neurosecretory cells release their product into an extracellular space that may be at some distance from the target cells. In an organism with a circulatory system, the neurohormones are typically sent by the vascular route to their target, whereas in lower invertebrates that lack an organized circulatory system the neurohormones apparently simply diffuse from the

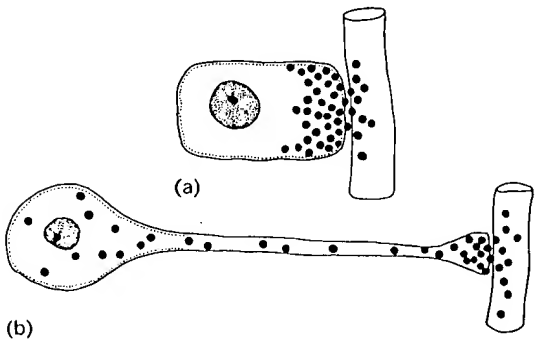


Fig. 1. Diagram of secretory cells, (*a*) Typical glandular cell (endocrine). (*b*) Typical neurosecretory cell.